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Research

1. General

a. Research in Czechoslovakia was developed to aid both planned production and existing production. After initial work in 1945, it was decided that research was to be expanded in every way under the Two-Year Plan. For this purpose a State Research Council was formed, with its headquarters in Platnerska Ulice, Prague II. This council was to recruit scientific technicians from universities and research institutes as well as individuals having factory experience in scientific and production fields and, with their assistance, was to work out a research plan. All production enterprises, both nationalized and privately-owned, and all public and private scientific and research institutes which were to participate in this plan were to present their research problems for incorporation into the research plan. This assignment was to be completed by March 1947. Directives for research in the various fields were drawn up by members of the Ministries of Food, Industry, and Agriculture, as well as by various economic groups, representatives of industrial enterprises, and workers from scientific and research institutes.

b. Research problems were broken up into three categories: 1) existing production, 2) planned production, and 3) scientific matters. In each research problem it was necessary to note the group to which it belonged, for example: III (chemistry), subgroup 7 (biochemistry), and priority (1,2,3, or 4). Moreover, it was required to state the problem, the possibly needed help, and the expected cost and guarantees. One such problem prepared for presentation was as follows:

III, 7, 1, biological and bacteriological control of medicinal drugs, Lucebne a Farmaceuticke Zavody (Chemical and Pharmaceutical Plants), Bratislava Technical College, 200,000 crowns, own guarantee.

c. Each nationalized corporation was to have its own research division under its own research adviser, and each branch of industry, such as the chemical industry, was to have a central director of research for the Czech provinces and another for Slovakia. The offices of these two directors were to be in Prague and Bratislava, respectively.

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d. The first weakness in this research was evidenced by the fact that the corporations confused research with production. As a result the research plan was replete with problems that were actually only suggestions for new products. Also, numerous difficult problems, of which many were insoluble and many identical, were presented. These research problems having nationwide significance but requiring time and considerable investment were not accepted, even though they appeared to be of potential value.

e. The following research problems were introduced by Dynamit Nobel of Bratislava:

(1) Regeneration of old contact materials (100,000 crowns),
(2) Working out the production of new materials (100,000 crowns),

(Both of the above were intended for the production of sulphuric acid by the contact method.)

(3) Chemically pure chemicals (200,000 crowns),
(4) Processing of waste arsenic trioxide (50,000 crowns),
(5) Producing developers (150,000 crowns),
(6) Producing organometallic preparations (150,000 crowns),
(7) Softening agents (150,000 crowns),
(8) Aliphatic sulphonates based on paraffinated oils (200,000 crowns),
(9) Research on the process of methane fermentation of cellulose wastes (200,000 crowns),
(10) Testing and improving synthetic fibers of viscose (200,000 crowns).

Dynamit Nobel opened its own research institute with great ceremony at the beginning of the summer of 1947. This institute was to serve all Slovak chemistry needs. It was equipped excellently and was one of the best institutes in the country. However, it never began operating because capable scientific workers were not found. At the beginning of 1949, no chemically pure arsenic-free hydrochloric acid was obtainable in Czechoslovakia.

f. The following is another illustration of research problems as submitted by the Slovak Rafinerie Mineralnych Olejov (Refineries of Mineral Oils):

(1) Removing paraffin by propane,
(2) Refining by means of phenol and furfural,
(3) Synthetic production of oppanol and peraton (sic), polymerization of cracked gases by means of aluminum chloride (an I.G. Farben patent),
(4) Filtration of paraffin using Waschtauch filters, Weinhold system,
(5) Centrifugal refining of cracking gasolines, Bergedorf system,
(6) Oxidation of paraffins to aliphatic acids and purification of those acids,
(7) Production of soaps and lubricants from synthetic aliphatic acids,
(8) Sulphohalogenation of paraffin hydrocarbons, production of mersol and mersolate (sic).

g. All research problems were handled first locally and then by the general management, and after much delay they were incorporated into the research plan. This plan filled a book of about five hundred pages for the chemical industry alone.

h. The greatest difficulty regarding the research plan was in controlling its fulfillment. At first reports were required quarterly, later monthly. If any phase of the research plan were not completed during the Two-Year Plan, control commissions were to be set up under the Five-Year Plan. These commissions were to investigate the solution of a problem in order to see what results had already been achieved. As late as the middle of 1949, however, these commissions had not begun to operate since not enough technicians were

available. Another change, based on experiences under the Two-Year Plan, was made in the Five-Year Plan. The individual ministries which had created special departments for research during 1948 were combined. The principal directives were to come from these groups, and proposals, along with research work, were to be submitted to them.

2. Specific

a. Edible Fats.

1) The following principal tasks were set for the field of edible fats:

(a) Research in the synthesis of fats.

(1) Preparation of higher aliphatic acids,
(2) Preparation of glycerine,
(3) Esterification of the above.

(b) Research in the selective refining of fats. This means refining fats so that all undesirable components are removed. All former methods, including both chemical refining and physical processing by means of bleaching clays, remove biologically important materials along with the impurities, thus reducing the value of the fats.

(c) Research in the hardening of fats. The principal features of this problem are:

(1) Catalysts,
(2) Hardening at low temperatures,
(3) Selective hardening,
(4) Continous hardening with a solid catalyst and circulating oil and hydrogen.

(d) Research on the possibilities of replacing fats and oils in industrial processes. This program sought new raw materials, free of fats, for:

(1) Auxiliary preparations for the textile industry,
(2) Auxiliary preparations for the leatherworking industry,
(3) Washing and cleansing agents for industry, small businesses, and domestic use.

(e) Research on the production of vegetable fodders by biological synthesis.

2) Fats in Czechoslovakia are derived largely from animal sources, and therefore the problem of fats is at the same time a problem of fodder. It was decided that an increased supply of fodder would help solve the fat problem, and entirely new sources of fodder in addition to an increased agricultural yield were needed. Since fodder can be obtained from edible ferments, it was determined to work out a basis of industrial production of ferments from carbohydrates, which could be produced cheaply within the country. Materials suggested for experimental purposes were roastings from distilleries, hydrolyzed potato starch, and hydrolyzed cellulose. Experiments were conducted particularly on the derivation of sugar from wood by the hydrolysis of cellulose with weak mineral acids (Scholler-Tornesch method).

b. Food Industry

1) Food research in Czechoslovakia was concentrated in the Ministry of Food. This Ministry had its own research group in Prague II, Potrska Ulice, with Ing. Nebovidsky at the head. At the same time an extensive

library of technical literature was established, together with a special research documentation division, headed by Ing. Kveton. This was located nearby in Hastalska Ulice. Prior to that time, a documentation center had been built in Prague I, on Marianske Namesti, in the building of the library of the Technical Colleges, in the Klementinum. The director of this center is Ing. Medonos, and the assistant director Ing. K. Havlicek.

2) The following principal tasks were set for the food industry for the year:

   (a) To develop all methods of preserving food which will make it possible to keep food during the period between the two harvests, and which can assure a constant supply of food for the people and the army.

   (b) To form a new basis for feeding the people by introducing modern production techniques for biologically equivalent foods. These foods are to be made from domestic raw materials and are to replace those foods of which there is a shortage and which have to be imported.

3) It was decided to build an industry for the preservation of foods to the greatest extent possible. These factories were to be located in those regions having the best sources of materials, and they were to be capable of processing foods directly at the time of the harvest under the best technical conditions, waste to be estimated centrally. Losses would thus be reduced. For example, a third of the fruit and forest products have been spoiling each year in Czechoslovakia before they could be utilized. Not only would preserved foods last longer, but they would also be available to the consumer in a prepared state. This would save many future work hours and would free much manpower for other duties.

4) The method of preserving foods by drying has not been developed in Czechoslovakia; preserving by means of heat is the only method so far used. This latter method was capable of simple results: it could utilize wastes more efficiently and could be set up in better suited regions. The food industry was considered the most adaptable for the industrialization of poorer sections of the country. There were many regions, without any industry, which were to have been built up during the Two-Year Plan and which had so far been neglected. Among them were Pribram, Breznice and Pisek in Southern Bohemia.

5) A special task was assigned to the frozen-food industry. The freezing method was to be utilized in military feeding to overcome the onesidedness of food preserved with heat. This was to assure a military diet of greater value and of better taste. The qualities of frozen foods are least affected by other influences, and therefore frozen foods were considered the most desirable for supplementing the military diet.

6) The following necessary conditions were established for realizing the low-temperature preservation of food:

   (a) Research on convenient techniques,

   (b) Well-developed technology,

   (c) An organization which will assure continuous refrigeration up to the time of sale.

7) A number of questions were presented for research:

   (a) To what extent and at what temperatures is frozen food protected against the activity of microorganisms?

   (b) How is the activity of enzymes limited by reduced temperatures?

(c) What changes are effected in food during freezing and during refrigeration?

(d) What changes are caused by these two techniques in individual kinds of foods?

(e) What are the results of the changes in the structures of foods caused by fast and by slow freezing?

(f) What is the significance for various types of foods of the number of crystallization centers and the degree of dispersion of crystals throughout the foods which have been frozen quickly and those which have been frozen slowly?

(g) From the changes determined to be the results of fast and slow freezing, which of these methods would be chosen for individual foods?

The majority of the simpler aspects of these questions was answered directly by specialists with the help of the documentation center. New information was to be obtained under operating conditions and was to be disseminated as quickly as possible.

8) The principles of low-temperature refrigeration on the basis of the questions presented above were formulated in the following manner:

(a) Quick freezing results in generally smaller changes in structure than in slow freezing. The changes caused by freezing and those caused by storage are different in individual types of foods.

(b) The colloidal chemical changes caused by freezing meat are smaller than those which appear during storage. During storage meats dry out and lose their juices, and the fats grow rancid. This decaying process is slowed down primarily by low temperature storage and by reducing the circulation of air. Therefore, meat cannot be moved while it is being frozen or stored, and low temperatures must be used, not only for freezing, but also for storage.

The same is generally true of edible fats, of which it is even more important to prevent oxidation. It is so important to limit the movement of air around fats while they are being frozen that air-tight wrapping is recommended.

(c) Enzyme activity, both in meats and in fats, is slowed down so much by low temperatures that changes in appearance and taste are noticeable only after long storage. It is just these enzymatic changes which cause difficulties in freezing vegetables and fruits. The sensitivity of these products depends on their acidity. Those with a low concentration of hydrogen ions are less susceptible to this type of damage. The speed of freezing has little effect either on appearance or taste of vegetables and fruits, or on their content of vitamin C. If fruits are frozen without the addition of a sugar solution, the vitamin content drops.

9) The construction of planned freezing centers together with an adequate number of refrigerating transport media will make it possible to supply perishable goods to consumers during the summer almost without loss and will assure supplementary military feeding. These military foods will last two years, in compliance with military requirements.

c. Substitute Raw Materials

1) Another research problem was in substitute raw materials, and a

proposal was made and accepted to use the by-products of refining and to isolate naphthenic acids for the purpose of replacing aliphatic acids. A new method of isolating these acids was developed and a private firm agreed to undertake these experiments. Since the results of this method under operating conditions were not certain, this firm easily obtained permission to proceed even with the technological investigations. Thus, the production of naphthenic acids began in private industry in 1947. The first efforts to transfer this production to nationalized industry were resisted because the technical problems connected with production were not yet solved. In mid-1948, the Ministry of National Defense requested through the Ministry of Industry samples of these products to be furnished them at irregular intervals. When, in December 1948, the Ceskoslovenske Tukove Zavody (Czechoslovak Fat Factories) requested nationalization of the enterprise, details of production were refused them. Upon request of the Ministry of National Defense production was allowed to continue, and the firm was given a quota of items for military use. At the beginning of January 1949, this quota was for one thousand kilograms of naphthenic acids annually, but by the end of that same month it was raised to ten thousand kilograms, with delivery to begin in May 1949. Meanwhile, the Ministry of National Defense took samples continually to the Vojensky Technicky Ustav (Military Technical Institute) for experimentation. All the refineries in the country, however, were unable to produce enough raw materials for the production of ten thousand kilograms of naphthenic acids per year, and for this reason the Ministry of National Defense permitted the firm to import raw materials from Rumania through Chemapol.

d. Antibiotics. In Czechoslovakia the study of substances produced by microorganisms and the use of these substances as antibacterial agents were divided into two categories:

1) Development of concepts already known and constructing a penicillin station using machinery bought in other countries,

2) Studying new cultures and new uses.

Research in this field was done by Dr. Richard Adamek of the Chemical Institute of Prague who is a very capable bacteriologist [redacted] 50X1-HUM
[redacted] the best in Czechoslovakia at this time. Dr Adamek is the only one who has had results from research. He began to work on antibiotics at the beginning of the last war. At first he investigated the 50X1-HUM
activity of substances produced by various species of penicillium. The penicillin he produced in his laboratory was the first in Czechoslovakia, and it was used clinically even before the end of the war. After 1945, when his co-worker Dr. Rauchenberger returned from a concentration camp, with Dr. Adamek began to work on actual tests on living specimens for a new antibiotic product which he had isolated from a completely new culture. In spite of his lack of aggressiveness Dr. Adamek became quite well known for this work, but he was prevented from making any use of his research by older scientific workers who considered this subject their own domain and by new organizers who were annoyed because Adamek was not a member of the Communist Party. Nevertheless, beginning in 1947, Adamek was consulted about these problems and was given an important task in antibiotics under research included in the Two-Year Plan. At Then the time Adamek became a member of the Communist Party, part of the main research activity in antibiotics was transferred to the Chemical Institute of Prague, where not only new therapeutic antibacterial agents against tuberculosis and typhus were studied, but research was also conducted on new techniques for the food industry. Dr. Adamek was offered a job in producing penicillin in the spring of 1949 when the new plant was being organized in Roztoky, but he preferred to remain at the Chemical Institute of Prague. It had been decided that this institute would →

become an unpublicized, productive research center for antibiotic and food problems.

Dr. Adamek is a new figure in the Czech scientific world. He is considered very valuable during the present shortage of trained personnel, and he has the confidence of the Communist Party.

1) Penicillin. The production of penicillin has been started, although no penicillin has actually been made. The following problems have yet to be solved:

   (a) In production.

      (1) Choice of proper media. Culture which will raise the yield are constantly being sought. It was decided to experiment systematically with various types of sugars, nitrogenous materials, and mashes of various grains and seeds.

      (2) Determination of optimal aeration conditions. This includes the intensity of aeration, the effect of mixing, and the best shape for tanks.

   (b) In isolation. Isolation consists of extracting the free acid and in converting it into a water-soluble salt. For this purpose the following were to be tested systematically:

      (1) Solvents, including the testing of known ones (amylacetate, ether, chloroform) and the searching for new ones.

      (2) Specific precipitants.

      (3) Benzylpenicillin.

   (c) In activity and applications.

      (1) Testing antibiotic activity.

      (2) Systematic study of infections caused by staphylococci, hemolytic streptococci, anaerobic streptococci, and by pneumococci, gonococci, meningococci, clostridia, and treponema syphilis.

      (3) Dose administration.

The State Research Council considered penicillin the most urgent problem for antibiotic research:

2) Streptomycin.

   (a) The antibiotic streptomycin, which comes from an actinomycete, is little known from domestic experience in Czechoslovakia, primarily because it has been available only in small quantities. Information on streptomycin was therefore limited to that obtained from other countries, and experimental data could be procured domestically only from laboratory work.

   (b) Experimental work is being done in several research institutes in the Ustav pro Vyzkum Leciv (Institute for Drug Research) (such as by Dr. Mansfeldova) and is probably still confined to retesting information acquired from other countries. It is known that:

      (1) Streptomycin is obtained from streptomyces grisens;

      (2) The culture medium which is being used either contains sugar (e.g., dextrose) or nitrogenous material (e.g.,

casein extract, cereal starch, or soy flour);

(3) Purification is accomplished by adsorption. The Waksman isolation procedure is followed, and adsorption is done on Norit (sic) in a neutral medium. Separation is made from an acid medium by ethyl alcohol, and precipitation is accomplished by acetone.

/ (c) It is known that streptomycin has a selective therapeutic activity in connection with certain pathogenic microorganisms. Available practical experience showed that the effect of streptomycin on certain kinds of tuberculosis is very problematical, with respect both to the character of streptomycin and to the type of illness against which it is being used. Since the effect of streptomycin in treating some types of tuberculosis is uncertain, it was decided to conduct practical clinical experiments and to develop a new method of treatment only on that basis. It was also decided to investigate its use in tularemia, influenzal menigitis, and infections of the urinary tract.

3) New Antibiotics

(a) In 1945, Dr. Adamek together with Dr. Rauchenberg, who had become the director of the hospital in Motol after returning from the concentration camp, began studying a new antibacterial agent. This agent has been isolated from a certain culture under certain conditions and prevents the reproduction of several pathogenic microorganisms. Therapeutic activity against tuberculosis and typhus has been found in this material, and it has been tested so far in test tubes on bacterial cultures.

(b) Industrial applications of new antibiotics were also investigated at the Chemical Institute. Dr. Jos. Fidler, at the instigation of Dr. Adamek, was primarily interested in this research which was aimed at preserving milk by the use of antibiotics. The idea was to limit bacterial activity and thus prevent milk from souring, which causes enormous losses particularly during the summer. This work was begun during the second half of 1947, and remarkable results were obtained so that the souring of milk has been slowed down to three days.

3. Miscellaneous

a. Spofa (United Pharmaceutical Works) was engaged in bacteriological research and preparations for large-scale bacterial cultures. The former Medika, in Vysocany, was first interested in this type of work, which consisted of producing meat extracts and peptone for the preparation of nourishing media for bacterial cultivation. The original impetus for this production, however, came from the desire to make products which had been previously imported. About the end of 1947, the research division of Spofa asked the Chemical Institute of Prague what quantity of meat extracts was necessary to prepare these bacterial media, what were the possible supplies of peptone, and in what manner the meat extracts could be obtained. The Chemical Institute, which is in charge of the purification of all water for the city of Prague and which makes an average of fifty tests of this water daily, replied that it had its own means for preparing bacterial media and that it prepared its own meat extracts. Spofa then explained that they planned to produce peptone for other purposes and that they needed to know generally where, for what purposes, and with what quantities of culture medium work was being done on bacteria. Spofa had begun producing peptone from muscle tissue and from ox pancreas. The technique of this manufacture is similar to that used by the Merck firm in Darmstadt. Production capacity was planned at two thousand kilograms annually and was to be expanded later. At the same time a special bacteriological peptone from casein had been prepared.

The order to begin production came from the general management of the Chemie Corporation and was motivated by a desire to be self-sufficient.

b. At the end of 1947, the underground factory at Prievidza belonged to the military and was not in operation. It had been considerably damaged, both by the uprising and by the Russians, its principal loss consisting of stolen equipment. The ethylene station at the factory which used the catalytic dehydration of ethyl alcohol was incomplete.

c. In the first half of 1948, the Chemical Institute of Prague received an order to test all auxiliary sources of drinking water (public and private wells). These were to be cleaned out if necessary, and tested monthly for bacterial infection. All auxiliary sources of drinking water within the city of Prague which could be locally sterilized, even though they had not been used for decades, were to be constantly under observation. Furthermore, the Chemical Institute was immediately to insure all necessary means of providing an emergency supply of water by the use of containers for delivering drinking water. These containers were to be maintained in a sterilized and serviceable condition for future use. Finally, both leading and auxiliary personnel were to have katadyn (sic) ready for supplying to water sources. Supplies of this material, which was the one preparation for sterilizing infected water sources in case of bacteriological war even during the occupation period, were kept in the warehouse of the Trznice (Market Building) in Rytirska Ulice, Prague I. Dr. Vsetecka, Ing. Zuckriegel, and Ing. Tovara were responsible for this warehouse.

II Military Techniques

1. Civil Defense

Within the framework of general military training in Czechoslovakia, there has never been any training in the use of new military techniques, either gas or bacterial. Steps have been taken, however, which indicate that plans are being made to use such military techniques. In June 1948, the Chemical Institute of Prague was asked to release a chemist immediately to work as the director of the civil defense of Prague and Prague Kraj. This director of civil defense is to be under military leadership. His immediate superior in time of peace will be the commander of the Military Technical Institute, and in time of war it will be the military commander of that sector. The director is to organize civil defense in a military manner and is to cooperate closely with units of the military technical service; he will also direct the Chemical Institute of Civil Defense, which is to cooperate closely with the Military Technical Institute.

2. Gas Warfare

a. The military units which were associated with gas warfare practice were always units of the technical service, whose task was to train a designated number of members of all military units in storing and testing gas masks.

b. The Chemical Institute near Olomouc was responsible only for routine tasks in connection with the testing of gas masks. This included fitting the masks and testing their filters. The Institute did not carry on research or production.

3. Military Products

a. All research concerning military products was directed by the Ministry of National Defense. The Military Technical Institute in Prague was named to carry out this research. Production of military goods was assigned to civil enterprises, most of which are now nationalized. These enterprises were sometimes under military supervision, and this supervision was constantly being supplemented by that from civilian members of the Communist

Party.

b. The Chema-Lutin factory is the most outstanding enterprise in which both research and production of new military items have been carried on for a long time. This factory was closely connected with the Zikmund Brothers enterprise where tests on remote control ignition were conducted in 1938 in the presence of military experts. The principal divisions of that factory then were the explosives division, poison gas division, and hygiene division.

c. Every factory which might be of military value was to be investigated by a division of the Ministry of National Defense, and the Military Technical Institute was to base its decision on such inspection. When the Ministry of National Defense needed an item for military purposes, the Military Technical Institute carried out tests of samples, but the principal task of this Institute was military research.